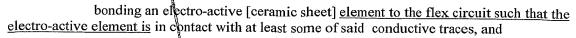
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assembling the flex circuit and the electro-active [ceramic sheet] <u>element</u> together so as to constitute a card such that the [sheet] <u>electro-active element</u> has a non-shear coupling over a region to an outer face of the card and is electrically coupled over said region to an electrode of said flex circuit.

23. (Amended) A method of forming an electro-active device, such method comprising the [step] steps of:

preparing first and second flex circuits with first and second electrodes and a recess therebetween, and

bonding at least one electro-active element in the recess in mechanical and electrical contact with said flex circuits over its surface area to form a unitary electro-active structure.

- 25. (Amended) The method of claim 21, wherein the step of bonding includes bonding plural pairs of electro-active [ceramic sheets] elements in the card.
- 26. (Amended) The method of claim 21, wherein said flex circuit is pliable in a region away from said electro-active [ceramic sheet] element.
- 30. (Amended) The method of claim 20, wherein the step of bonding hardens the flex circuit and bonded electro-active [ceramic sheet] element into a card.
- 32. The actuator device of claim 56, wherein said electro-active ceramic element is bonded to said polymer insulator with a material selected from the group consisting of a heat-curable epoxy, a pressure-curable epoxy, and a low temperature adhesive.
- 33. The actuator device of claim 56, wherein said polymer insulator comprises a material selected from the group consisting of a polyamide, a polyimide, and a polyester.
- 34. The actuator device of claim 56, further comprising at least one spacer coplanar with said electro-active ceramic element, wherein the at least one spacer contacts the polymer insulator.
- 35. The actuator device of claim 34, wherein said spacer comprises a frame.
- 36. The actuator device of claim 56, wherein said conductor comprises an electrode.
- 37. The actuator device of claim 56, wherein said electro-active ceramic element is bonded to said polymer insulator with a material comprising a heat-curable epoxy, thereby providing strength to said actuator device.
- 38. The actuator device of claim 56, wherein said electro-active element comprises a first electro-active element and a second electro-active element, each of said first and second electro-active elements having at least one metal-coated surface.\
- 39. The actuator device of claim 38, wherein said metal-coated surface of said first electro-active element is in direct electrical contact with said metal-coated surface of said second electro-active element.

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- The actuator device of claim 56, wherein said electro-active element comprises a first 40. electro-active element having a metal-coated surface, and a second electro-active element, and wherein said second electro-active element is in direct electrical contact with said metal-coated surface of said first electro-active element.
- The actuator device of claim 40 further comprising at least one spacer substantially 41. coplanar to the electro-active ceramic element, wherein the spacer contacts the polymer insulator.
- The actuator device of clarm 56, said device further comprising an enclosing layer encasing said electro-active ceramic element and said flex circuit, and wherein said actuator device forms a card.
- The actuator device of claim 21, further having a metal layer comprising copper. 43.
- The actuator device of claim \$6, wherein said actuator device has a curved shape. 44.
- The actuator device of claim 3 \(\frac{1}{3} \), wherein said heat-curable epoxy forms a bonding layer 45. defining a plurality of voids.
- The actuator device of claim 45, wherein said second conductor is in direct electrical 46. contact with said electro-active element through said voids.
- The actuator device of claim 56, wherein said actuator device is configured as a stack, a flexure, a shell, a plate, or a bender.
- 48. An actuator device comprising:

an electro-active ceramic element including a first conductor;

a second conductor, and

a polymer insulator,

wherein at least said second conductor is in direct electrical contact with said first conductor of said electro-active ceramic element, and

wherein said electro-active ceramic element and said polymer insulator are bonded together such that in-plane strain in said electro-active element is shear coupled between said electro-active element and said insulator,

further comprising at least one circuit element in electrical communication with the electro-active ceramic element.

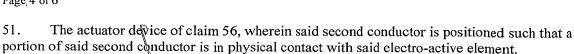
The actuator device of claim 43, said electro-active element comprising a first electroactive element and a second electro-active element, and said metal layer having a first surface and a second surface,

wherein said first surface of said metal layer is in direct electrical contact with said first electro-active element, and

wherein said second surface of said metal layer is in direct electrical contact with said second electro-active element.

The actuator device of claim 56, wherein said second conductor is positioned between 50. said electro-active ceramic element and said polymer insulator.

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- 52. The actuator device of claim 56 further comprising an electrical connector in direct electrical contact with said second conductor.
- 53. The actuator device of claim 56 wherein said second conductor is in direct electrical contact with said electro-active element at a plurality of points.
- 54. The actuator device of claim 56, wherein said actuator device is shear-coupled to an object.
- 55. A method for damping vibration of an object, said method comprising the steps of:
- (a) bonding the actuator device of claim 56 to a surface of the object such that in-plane strain of the electro-active ceramic element mechanically acts on the object through said polymer insulator when an electrical signal is applied to said second conductor; and
 - (b) applying an electrical signal to said second conductor.
- 56. An actuator device comprising:

an electro-active ceramic element including a first conductor; and

a flex circuit comprising a polymer insulator and a second conductor,

wherein said electro-active ceramic element is bonded to said flex circuit such that inplane strain in said electro-active ceramic element is shear coupled between said electro-active ceramic element and said flex circuit, and

wherein said second conductor is in direct electrical contact with said first conductor of said electro-active ceramic element.

57. An actuator device comprising:

an electro-active ceramic element;

a flex circuit comprising a polymer insulator, a first electrode and a second electrode; and

a bonding layer adhering said electro-active ceramic element to said flex circuit such that in-plane strain in said electro-active ceramic element is shear coupled between said electro-active element and said flex circuit,

wherein each of said first and second electrodes is configured as a comb having a plurality of teeth, said first and second electrodes being interdigitated,

wherein said first and second electrodes are in direct electrical contact with said electroactive ceramic element, and

wherein said electro-active element having a first surface and a second surface, said first and second electrodes being in direct electrical contact with said first surface of said electroactive ceramic element, and

said flex circuit further comprising a third electrode and a forth electrode,